Changes in Clinical Management Following 14-Day Ambulatory ECG Monitoring Following Emergency Department Evaluation for Unexplained Syncope

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INTRODUCTION

Syncope is a common emergency department (ED) presentation estimated to cost the US health care system $2.3 billion annually.[1] Research has focused on risk stratification instruments for major adverse events following ED evaluation for syncope.[1] Wearable, patch-based 14-day ambulatory ECG monitors can easily be placed in the ED at discharge.[2] The Diagnostic Yield of an Ambulatory Patch Monitor in Unexplained Emergency Department Syncope (PATCH-ED) study found that ambulatory ECG monitor placement following an ED evaluation for syncope increased arrhythmia diagnoses compared to historical controls.[2] The Monitoring of SYNcopes and/or sustained palpitations of suspected ARRhythmic origin (SYNARR-Flash) trial showed increased arrhythmia diagnosis when the ambulatory ECG monitor was placed closer to the antecedent syncopal event.[3] Many patients who experience syncope do not follow up for outpatient cardiac monitoring.[4] No study to date has addressed the clinical impacts of ED-initiated ambulatory ECG monitor placement for unexplained syncope. We initiated an ED-based protocol for 14-day ambulatory ECG monitor placement by ED staff following evaluation for syncope. The objective of this study was to evaluate this protocol's effect on medical management.

METHODS

This was a retrospective study of patients discharged from the ED or ED observation unit of a single, urban, tertiary care academic hospital with an annual ED volume of 50,000 patients. This manuscript is compliant with Strengthening the Reporting of Observational Studies in Epidemiology guidelines for observational studies. We included patients with unexplained syncope from February 2019 to May 2021 who had a 14-day ambulatory ECG monitor (Zio XT, iRhythm) placed at the time of discharge. The discharging clinician had the option of ordering an ambulatory ECG monitor for any patient with syncope during this period and did so based on clinical suspicion of arrhythmia. Ambulatory ECG monitoring findings were verified by cardiology. Emergency physicians advised follow-up in ED or at clinic as clinically indicated. Change in medical management was defined as (1) initiation of or change in antiarrhythmic medications, (2) diagnostic testing as defined by orders placed after acquiring ambulatory ECG monitoring results, or (3) cardiac-related procedures for management of arrhythmias identified by the ambulatory ECG monitor.

Emergent arrhythmias were defined by iRhythm protocol (sinus pause of >5 seconds, high-grade heart block, or ventricular tachycardia). Chart abstractors (C.G. and C.F.) were not blinded to outcomes. Abstractions occurred 1 year following the end of the study period. Coding rules and classifications were reviewed and adjudicated by the principal investigator (A.B.M.). Descriptive statistics were performed using STATA v17 (Stata Corp).

RESULTS

During the study period, 1,602 ED patients were diagnosed with syncope. We included 126 patients with a

Table 1. Characteristics of patients discharged from the ED and ED observation unit wearing a 14-day ambulatory ECG monitor during the study period.

Demographics	ED Observation Discharge (n = 64)	ED Discharge (n = 51)
Age (y), mean (SD)	63.7 (17.2)	51.9 (16.7)
Male	30 (47%)	25 (49%)
Race		
American Indian	1 (2%)	3 (6%)
Asian	3 (5%)	2 (4%)
Asian, White	0	1 (2%)
Black	2 (3%)	1 (2%)
Declined	1 (2%)	2 (4%)
Pacific Islander	0	1 (2%)
White	57 (88%)	41 (80%)
Ethnicity		
Hispanic	3 (5%)	0
Non-Hispanic	47 (73%)	46 (90%)
Unknown	2 (3%)	1 (2%)
Declined	12 (19%)	4 (8%)
Medical comorbidities		
Congestive heart failure	13 (20%)	5 (10%)
Myocardial infarction	6 (9%)	6 (12%)
Coronary artery disease	12 (19%)	5 (10%)
Atrial fibrillation/flutter	7 (11%)	2 (4%)
Arrhythmia, other	10 (16%)	6 (12%)
Valvular heart disease	14 (22%)	5 (10%)
Heart palpitations	14 (22%)	10 (20%)

Variable distributions are reported as n (%) unless otherwise specified.

mean (SD) age of 59 years (18 years) (53% women) who underwent ambulatory ECG monitor placement in the ED or ED observation unit at the time of discharge (Table 1). One hundred fifteen patients (91%) returned the ambulatory ECG monitor and were included in our final analysis. Fifty-one patients were discharged from the ED, and 64 patients were admitted to and subsequently discharged from the ED observation unit. Twelve patients (10.3%; 95% confidence interval [CI] 5.5% to 17.5%) had ambulatory ECG monitoring findings resulting in change in medical management. Of these 12 patients, 4 (3.5%; 95% confidence interval 0.9% to 8.6%) returned to the ED for an emergent arrhythmia. Detected arrhythmias prompted the following interventions: initiation or adjustment of antiarrhythmic medications for 8 patients (67%); pacemaker implantation for 4 patients (25%), implantable loop recorder for 4 patients (25%), diagnostic cardiac catheterization for 2 patients (16.7%), and catheter ablation for 1 patient (8.3%) (Table 2). No patient experienced death due to any cause, syncope, sudden death, or injury due to arrhythmia after ED discharge during the 14-day monitoring period.

Table 2. Demographics, arrhythmia diagnosis, and medical management following ambulatory ECG monitoring for unexplained syncope.

Patient	Age (y)	Sex	Arrhythmia	Medical Management Change
1*	67	M	VT	ICD threshold change, increase amiodarone
2*	72	F	Intermittent CHB	Pacemaker implantation
3*	84	M	Mobitz II, NSVT, ventricular pause	Pacemaker implantation
4*	73	M	Sinus pause, CHB	Pacemaker implantation
5	62	M	NSVT, trigeminy	Left heart catheterization, increase metoprolol
6	73	F	SVT, NS-SVT, NSVT	Implantable loop recorder, start carvedilol
7	84	F	AFib, NSVT	Implantable loop recorder, start metoprolol succinate
8	40	F	Intermittent Mobitz I, brief CHB	Implantable loop recorder
9	69	M	NS-SVT	Start metoprolol succinate, nuclear medicine study
10	82	F	NSVT, NS-SVT	Start metoprolol succinate
11	70	M	NS-SVT	Start metoprolol succinate
12	65	F	SVT, NSVT, high PVC burden	Increase metoprolol succinate, left heart catheterization, PVC ablation

AFib, Atrial fibrillation; *CHB*, complete heart block; *F*, female; *ICD*, implantable cardiac defibrillator; *M*, male; *NS-SVT*, nonsustained supraventricular tachycardia; *NSVT*, nonsustained ventricular tachycardia; *PVC*, premature ventricular contraction; *SVT*, supraventricular tachycardia; *VT*, ventricular tachycardia.
*Patients 1 to 4 were contacted to immediately return to the ED based on their ambulatory ECG monitoring findings. Interventions are as listed above.

DISCUSSION

Limitations of this study include small sample size, single-center design, retrospective review, and lack of a control group, time-to-treatment analysis, and blinding of data abstractors. During the study period, results were managed by the prescribing physician or advanced practice provider. To improve efficiency and continuity of care, the electrophysiology department subsequently assumed responsibility for following up on ED-prescribed ambulatory ECG monitoring results. In this sample of patients with unexplained syncope who had ambulatory ECG monitors placed at ED or ED observation unit discharge, changes in medical management occurred in 10% of patients. Four patients (3.5%) were found to have an emergent arrhythmia warranting immediate return to the ED. Although this exceeds the widely accepted ED benchmark of a 2% miss rate for life-threatening events such as acute coronary syndrome, none of our patients had arrhythmia-related morbidity or mortality during the follow-up period.[5] ED-placed ambulatory ECG monitors for unexplained syncope had high compliance, frequently diagnosed arrhythmic etiologies of syncope, and led to clinically important changes in medical management. Future prospective trials should assess the time to change in medical management and time to arrhythmia diagnosis and incorporate a control group.

Andrew B. Moore, MD, MCR
Colin Gershon, NP, MPH
Christa Fiske, PA-C
Benjamin Sun, MD, MPP
Babek Nazer, MD
Bory Kea, MD, MCR

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Author affiliations: From the Department of Emergency Medicine (Moore), Virginia Tech Carilion School of Medicine, Roanoke, VA; the Department of Emergency Medicine (Gershon, Fiske, Kea), Oregon Health and Science University, Portland, OR; the Department of Emergency Medicine (Sun), University of

Pennsylvania Scholl of Medicine, Philadelphia, PA; and the Division of Cardiology (Nazer), University of Washington School of Medicine, Seattle, WA.

Corresponding Author email: abmoore2@vt.edu

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